Verb Finiteness, Subject-Auxiliary Inversion and General Language Ability in Pre-school Children with Specific Language Impairment

A Senior Honors Thesis

Presented in partial fulfillment of the requirements for Graduation with Distinction in Speech and Hearing Science in the undergraduate college of The Ohio State University

by

Emily Hall

The Ohio State University
June 2011

Project Advisor: Dr. John Grinstead, Department of Spanish and Portuguese

Acknowledgments

I would like to take this opportunity to thank my advisor Dr. John Grinstead for asking me to join his research team, and for his patience and understanding in explaining the inner workings of syntax and grammar. Thanks too for all of his wisdom, encouragement and advice throughout the entire project. I would like to thank my research partner, Madelaine Heath, for her motivation and dedication to the project as well. I would like to also thank Professor Mike Edwards and Professor Ann O'Connell for their generous help with statistics. I am grateful to Professor Gutiérrez-Rexach for his willingness to both give of his time and use an alternate form of communication for the oral defense of this project, despite being out of the country. Thanks as well to Dr. Larry Feth for his sacrifice of time in the oral defense process. I would like to extend my gratitude to Morgan Donnellan and Paij Lintz for help during testing. This project has greatly benefitted from comments from the OSU Language Acquisition Discussion Group ("Lacqueys"). I would like to give a special thank you to all members of this group for kindly welcoming me into such a receptive and professional environment, for allowing me to present my research, and for aiding in editing and revision throughout all phases of this project. Great thanks as well to North Broadway Children's Center (NBCC) and Northwest Christian Child Care (NWCC) for assistance in providing subjects for this research. Thanks as well to all parents of study participants. This research study was funded by the Arts and Sciences Undergraduate Research Scholarship and the Social and Behavioral Sciences Undergraduate Research Scholarship.

Abstract

Children with Specific Language Impairment (SLI) are known to have problems marking finiteness (tense) on verbs. As a consequence, this has been shown as a clinical marker of the disorder. In this study, other constructions of difficulty for children with SLI are sought, as a means of improving diagnostic capabilities. To do this, a construction that theoretically depends on finiteness: subject-auxiliary inversion (SAI), is investigated. SAI is a word order alternation that occurs in questions, among other constructions, and has been shown to correlate in its development with finiteness. Work showing this correlation, however, was not able to remove the effects of general language development. To remedy this problem, and clarify whether SAI may be a potential clinical marker of SLI, three experiments were carried out. The first tested children's knowledge of the Binding Theory, which determines the structural configuration in which pronouns, like (him), and reflexives, like (himself), can be used. Procedurally, the grammaticality choice format was used in order to present an equal number of grammatical and ungrammatical constructions (Pratt & Grinstead 2007). Children showed improvement with age in their judgments of Binding. For Experiment 2, test items were compiled from previous grammaticality choice measures of finiteness, SAI, and pronoun case with items from the Binding Principles task in order to determine whether finiteness and SAI still correlate with one another, but not with Binding results. Binding was used as a proxy for general language development and was partialed out statistically. Samples from experiments one and two were compiled of typically-developing (TD) pre-school children, in order to gain a sample of TD age controls. The third experiment of this study aims to uncover specific language impaired children's

judgments of SAI in order to investigate the reality of predictions made. 53 children between the ages of 3;1 and 6;2 participated in this study.

Table of Contents

Chapter 1: Introduction and Literature Review

During the acquisition of child language, two major constructions, among others, develop in children age's three to five. The first, Subject-Auxiliary Inversion (SAI), can be observed in different grammatical constructions, including yes/no and wh-questions. Such sentences are commonly related to a declarative sentence displaying similar properties (Harris 1951, Goldberg & Del Giudice 2005) and English-speaking children have been documented to use SAI in wh- questions optionally in their preschool grammars (e.g. Bellugi 1965). The second construction, verb-finiteness (or tense), can also be observed in young children optionally. Often, children will produce verbs marked with finiteness and/or verbs in non-finite forms in the same time period (see Wexler 1994 for review). This thesis aims to investigate and empirically support the contention that these two constructions, and the fact that each is optional, are related. This thesis will consider two theories that have emerged concerning this connection.

Section 1.0: Syntactic Theories of Subject Auxiliary Inversion (SAI)

The first, Mainstream Generativist or Nativist Theory, posits that a connection between the two indeed exists in the adult grammar of English (Rizzi 1996, Den Besten 1983). Chomsky (1981) and Travis (1984) proposed that the Head Movement Constraint (HMC) regulates the syntax of verb movement. This constraint restricts the way in which a verb moves from the head of the Verb Phrase (VP) to the head of the Inflectional Phrase (IP). It is here (at the IP) where the verb is marked as finite (V-to-I). In SAI constructions, an auxiliary verb needs to move from the VP through the IP, to the head of the Complementizer Phrase (CP), a syntactically higher position. So, in order for a verb previously moved to IP for finiteness marking to reach the CP, it must move from VP to

IP to CP, as illustrated in Figure 1.1. In movement from IP to CP, the auxiliary verb switches places, or inverts, with the subject. Therefore, whenever a verb is seen to the left of the subject, it is known that the two have inverted, and the verb has been marked for finiteness. In this way, SAI is thought to be dependent on finiteness. This has come to be known as V-to-I-to-C movement. In wh- questions, this theory was posited to explain how verbs move to the left of the subject (Emonds 1976, Chomsky 1981 and Pollock 1989). What this means is that verbs that have inverted, or moved to the left of the subject (to the head of CP), must have passed through the head of IP, and, as a consequence, have been marked as finite. Therefore, finiteness becomes imperative for the occurrence of SAI.

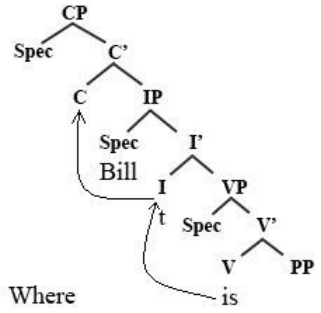


Figure 1.1 Example of Verb movement in wh- questions in English (Figure 1.1 from Vega Mendoza 2010)

This implication of necessary finiteness marking for verbs that have inverted in wh-questions is what will be investigated here in child English, following earlier work by Warren (2007), Ricci (2009) and Grinstead, Warren, Ricci & Sanderson (2009). It has been argued that the syntactic structure of SAI in adult English is based on a set of

patterns that deviates from the typical sentence structure. SAI is exemplified in yes/no questions like "*Did she go"* and in *wh*-questions like "*Where did she go?"* (Goldberg 2005).

Section 1.1: The Optional Infinitive Stage

Some argue that children learn language quickly and easily because an innate language faculty, called Universal Grammar (UG), fundamentally underlies language ability. Proponents of this idea have nonetheless shown that children produce errors in finiteness marking. This phenomenon, referred to as the Optional Infinitive Stage (Wexler 1994, 1998), consists of children marking verbs as finite and as nonfinite in the same stage of development, often in the same recording session. In the following third singular –s marking examples from Harris & Wexler (1996, p. 11), taken from the Brown Corpus (Brown 1973) and the Bloom Corpus (Bloom, Hood and Lightbown 1974), both the bare stem and the inflected form are seen in the same recording session ("file"):

(1.1) Eve (2;0 – file 14)

(a) It only write on the pad.

(b) My finger hurts.

(1.2) Peter (3;3 – file 8)

(a) Patsy need a screw.

(b) This goes in there.

The growth curves of finiteness marking documented for the typically-developing children from the language control groups in Rice, Wexler & Redmond (1999) and Rice, Wexler and Hershberger (1998) suggest that the OI stage persists until roughly 4;6. During this time, English-speaking children vary in their marking of verbs as finite. By hypothesis, this means that they vary in their ability to raise verbs from V to I. Grinstead, Warren, Ricci and Sanderson (2009) posit that the failure to invert verbs in SAI constructions noted in child English is fundamentally a function of the failure to mark verbs as finite, expressed as movement from V to I.

Section 1.2: SAI Errors in TD Children: Early Work

It is known that children make these errors in spontaneous production, as noted by Klima & Bellugi-Klima (1966). Specific errors are listed in example (1.3) below:

(1.3) (a) Where the other Joe will drive?

(b) Where I should put it when I make it up?

(c) What he can ride in?

(e) Why he don't know how to pretend?

(f) Why Kitty can't stand up?

(g) Which way they should go?

(h) How he can be a doctor?

(i) How they can't talk?

Similar results confirmed these initial findings, using both spontaneous production data (Ingram & Tyack 1979, Kuczaj & Brannick 1979), as well as elicited

production (e.g. Erreich 1984). Erreich showed that some children display very high percentages of uninverted wh- questions, depending on the wh- items used.

Spontaneous production errors in uninverted wh-questions are also seen in Ingram and Tyack (1979). These follow in example (1.4).

(1.4) (a) Where the raisins is?

(b) What I can eat?

(c) How this piece could go in?

(d) How this thing could go in?

(e) Where he is?

(f) Where you did go?

(g) What you did go?

(h) What he is going to do?

(i) How much I'm big?

(j) How much I do weigh?

The fact that wh- questions could be uninverted in relatively high percentages is in contradiction with the spirit of the proposal that Universal Grammar (UG) facilitates rapid acquisition of syntax by children. Supporters of UG believe that children are able to rapidly map rules governing syntax in general, and question formation in particular, from UG thereby producing very few errors in their early speech (Hyams 1986). Thus, children's errors with SAI stand as an enigma from the perspective of nativist language development.

Section 1.3: SAI Errors in TD Children: Constructivist Studies of SAI Errors

Constructivist studies of child language development follow the ideas of Goldberg (1995), who argues that neither children nor adults form questions through combinatorial syntax. Rather, adults produce memorized constructions and constructivists, such as Ambridge and Pine (2006) and Pine, Rowland, Lieven and Theakston (2005), argue that children learn these patterns as a whole. Critically for this thesis, such work assumes no inherent connection between verb movement, which many nativists assume to underlie both finiteness marking and subject-auxiliary inversion. As a consequence, any developmental connection between these constructions would be completely accidental on their view. SAI errors do not occur, from the constructivist point of view, because of the syntax involved in the production of *wh*-questions. Therefore, constructivists claim that when children make these errors, it is not because of a lack of syntactic knowledge. In their view, frequently heard patterns of speech are memorized, suggesting different combinations of *wh*-question words and auxiliaries (Rowland & Pine 2000). Since language then is based upon memorization, some constructivists posit that there is no relationship between verb finiteness and subject-verb inversion (Freudenthal, Pine and Gobet 2009)

Section 1.4: SAI Errors in TD Children: Nativist Studies

Some challenge the traditional claim that a child's knowledge displays a deficit regarding the syntax of inversion. To refute this claim, researchers have investigated the inversion of yes/no questions in pre-school language learners. To distinguish inversion from other aspects of grammar that may interact with inversion, researchers have compared declaratives to questions (Santelmann 2002).

Santelmann establishes that, for inversion to occur in modern English questions, an auxiliary or modal verb must move to a position that precedes the subjects. An example could be '**Is** Kermit eating a cookie?' It is also brought to light that in American English only one main verb, the copula *be*, undergoes inversion. All other main verbs require *do*-support, or, the insertion of the auxiliary *do*.

In summary, Santelmann and her colleagues show that, when word order is the sole difference between declaratives and questions, typical inverted structure in questions is not significantly more difficult than the non-inverted word order associated with declaratives in pre-school children. Importantly for this study, where children's repetitions of questions were more difficult for them than their repetitions of declaratives, the auxiliary verbs were always marked for inflections, as with *do* support. This stands in contrast with modal verbs, which children repeated with equal ease in declarative and interrogative sentences.

Following up this connection, Warren (2007), and Ricci (2009) investigate, connections previously studied between the grammatical constructions of finiteness and subject-auxiliary inversion for typically developing English-speaking pre-school aged children. Similar to the present undertaking, these studies originally aimed to investigate these connections within pre-school aged children with specific language impairment (SLI). The long-term, overarching goal of Warren, Ricci, and the present study, aims to find results that will lead to a better understanding of SLI. This understanding will ideally provide aide in diagnosis, and eventually treatment of the disorder.

Ricci tested children's knowledge of finiteness and subject-auxiliary inversion using the Grammaticality Choice Task (Pratt & Grinstead 2007), which will also be used

in this study. To measure children's judgments of Finiteness, the Nonfinite Grammaticality Choice Task was used. Results of the Finiteness Task by age and according to verb type follow in the table below:

	Copular *be*	**Aux. *be***	***-ed***	***-s***	**Overall Average Score**
3 year olds n= 10	83% correct	63% correct	68% correct	58% correct	68% correct
4 year olds n= 23	92% correct	79% correct	83% correct	90% correct	86% correct
5 year olds n= 30	93% correct	82% correct	84% correct	93% correct	88% correct

Table 1 – Overall Results of Finiteness Task by age (Table 2.3, from Ricci 2009, p. 20)

To measure children's knowledge of subject-auxiliary inversion, the Subject-Auxiliary Inversion Grammaticality Choice Task was used. Results of the Subject-Auxiliary Inversion Task by age and according to verb type follow in the table below.

	Copular *be*	**Aux. *be***	**Modal**	**Do support (past)**	**Do support (present)**	**Overall Average Score**
3 year olds n= 10	58% correct	65% correct	73% correct	68% correct	65% correct	66% correct
4 year olds n= 24	72% correct	67% correct	65% correct	83% correct	84% correct	74% correct
5 year olds n= 29	85% correct	83% correct	78% correct	91% correct	90% correct	85% correct

Table 1.2 – Overall Results of Inversion Task by Age according to Verb Type (Table 3.3, from Ricci 2009, p. 26)

In both of these assessments, a correct, inverted question (or finite verb) was given by one puppet, and the uninverted (or nonfinite) correlate of that question was given by another puppet. The child was then asked to point to the puppet that gave the correct construction. The justification for presenting children with a non-adult-like

construction is displayed in the fact that both forms are witnessed in child English spontaneous production. The goal, then, was to determine the degree to which children would choose the child-specific vs. the adult-like construction.

On the basis of the two independent grammaticality choice tests Ricci administered to 63 typically-developing children, she concludes that Finiteness and Subject-Auxiliary Inversion are related in typically developing children, on the basis of the correlation detailed in the following table.

Correlations

		Inversion	Finiteness
Inversion	Pearson Correlation	1	.525**
	Sig. (2-tailed)		<.001
	N	63	63
Finiteness	Pearson Correlation	.525**	1
	Sig. (2-tailed)	<.001	
	N	63	63

**. Correlation is significant at the 0.01 level (2-tailed).

Table 1.3 – The Correlation Between Finiteness Marking and SAI,(Table 4.1 from Ricci 2009, page 30)

Based on this previous work, there appears to be an empirical connection between verb finiteness (V-to-I movement, by hypothesis) and subject-auxiliary inversion (V-to-I-to-C movement, by hypothesis). In what follows, cross-validation of this finding is attempted in a new population, by investigating whether judgments of these two constructions correlate with one another, but not with other aspects of grammatical knowledge, namely, the Binding Principles (Chomsky 1981).

Following Ricci (2009), Grinstead, Warren, Ricci & Sanderson (2009) argue that wh- questions produced by children with uninverted auxiliaries, which appear to be finite,

are in fact nonfinite. Grinstead and his colleagues explore the hypothesis that subject-auxiliary inversion actually implies finiteness. In testing this hypothesis, a stage of development, called the Optional Infinitive Stage, becomes critical. This stage is characterized by a failure to consistently mark verbs as finite (Rice and Wexler 1996). This stage can also be called the Optional Inversion Stage (Grinstead, Warren, Ricci and Sanderson 2009). The Optional Inversion stage is a function of the Optional Infinitive stage and is characterized by a failure to consistently invert subjects and verbs in questions. Therefore, if auxiliaries in uninverted questions are non-finite, then a correlation should be found between judgments of finiteness and judgments of inversion in questions. This correlation holds true between the two tests, in spite of the fact that verb forms on the two tests varied. It is argued that subject-auxiliary inversion is used to mark finiteness in child English wh- questions syntactically, independently of children's morphology. Grinstead, Warren, Ricci and Sanderson show that finiteness marking and subject-auxiliary inversion judgment scores correlate. This supports the idea V-to-I (finiteness marking) is a previous step in the V-to-I-to-C (subject-aux inversion) process. The assumption is then that inverted auxiliary verbs are finite in questions.

Section 1.5: Specific Language Impairment (SLI) and SAI:
The Extended Optional Infinitive Stage (OI) in Child English SLI

It is known that an Optional Infinitive grammar is commonly found in child speech between the ages of 3 and 5 years old. While studying the language of children with SLI, two findings were uncovered. First, it was found that children operate in the same OI stage as their TD peers. Second, children with SLI show an Extended Optional Infinitive (EOI) grammar (Rice & Wexler 1996; Rice, Wexler, & Hershberger 1998), which consists of a prolonged and more severe period of difficulty with tense marking in language production.

It has also been shown that children with SLI have a greater struggle with grammaticality judgment than their TD peers. A sample of 30 children with SLI was assessed as part of a longitudinal study testing children's judgments of a range of finiteness markers (Rice, Wexler, & Redmond 1999) and was shown to be significantly worse than either age or language-matched peers at judging finite and nonfinite verbs, confirming the tense deficit as a receptive as well as an expressive problem.

Section 1.6: SLI and SAI: Wh- Questions and SLI

Children with SLI have been shown to have greater difficulty with wh- questions than do typically-developing children (van der Lely & Battell 2003). Arguing for a processing account of the SLI language deficit, Hildebrand (1987) and Deevy & Leonard (2004) show that wh- object questions, with a greater distance between the *wh*-phrase and the object than in *wh*-subject questions, can cause difficulty in the production and comprehension of such questions. Identification of this gap becomes critical because children cannot interpret these questions until the gap is identified. This takes much longer in *wh*-object questions.

SLI children are expected to fall behind their TD peers in comprehension of SAI due to difficulty comprehending movement in general (van der Lely & Battell). More specifically, it is thought that children with SLI will have difficulty with I→C movement, and therefore SAI, a hypothetically necessary step in the syntactic formation of questions (Ricci 2009).

Summarizing, some syntactic theories propose that the same syntactic processes necessary for verbs to be marked as finite are also necessary for verbs to invert to the left of the subject in subject-auxiliary inversion constructions. Supporting this view, typically-developing (TD) children's judgments of verb finiteness and SAI have been

shown to correlate. This correlation would be more strongly supported, however, if it could be shown that it were not the product of all language ability developing simultaneously. For this reason, we will now turn to a study of a theoretically unrelated area of grammar – pronoun coreference, or the Binding Principles – that children may or may not judge in a way that correlates with their judgments of finiteness and SAI. As previously stated, children with SLI have problems with both verb finiteness and wh-questions. This makes it plausible that they may show special problems with SAI. While this question will not be addressed directly in this thesis, it is hoped that this question will be addressed in future research.

Section 1.7: Research Questions

This foundation is the basis for two main research objectives.

1. Can it be shown that TD children's judgments of verb finiteness correlate with their judgments of SAI, but not with their judgments of the binding principles - another grammatical ability that develops gradually?
2. Can judgments of SAI be used to diagnose SLI?

In the following pages theory is placed into reality in the hope of gaining answers to the above questions.

Chapter 2: Grammaticality Choice Study of Binding Principles

Section 2.0: Introduction

A primary goal of this study is to provide a structure of support for the connection previously found between Verb Finiteness (VF) and Subject-Auxiliary Inversion (SAI) (Ricci 2009). This claim would be more strongly convincing if no correlation were found

between VF and some unrelated grammatical principle. If this were the case, VF and SAI would be found to correlate in connection with one another as children age. This third, unrelated, principle would have an independent rate of acquisition as children age. In other words, this would suggest that the connection between VF and SAI could not be attributed merely to the fact that all of language is developing together, but would provide evidence that a real connection exists between the two constructions.

Ricci (2009) shows that finiteness and inversion are correlated in children's judgments, but it is possible that this correlation is due to, namely, two other factors. First, it is possible that children's judgments of finiteness and SAI are simply improving with age. This argument is relatively simple to refute as this relationship has been tested previously with partial correlations that remove the variance associated with age. The results were then viewed to determine if the correlation still holds with age partialed out, which was found to be the case.

Second, one may be inclined to ask, "what if finiteness and SAI are not truly related, but rather, all of language is developing at the same rate?" Countering this argument has become a very important aim of this study. If it can be shown that another linguistic construct does not develop at the same rate, then support is provided for the idea that the relationship between finiteness and SAI is unique. Therefore, since children struggle with finiteness, it is likely that they will struggle with SAI. If this is true, then SAI can be used as a clinical marker for the disorder.

The next step was to identify a construction that was not plausibly related to finiteness (tense): a construction with no theoretical connection to finiteness or subject-auxiliary inversion. Children's ability to connect pronouns (e.g. *him*) and reflexives (e.g.

h*imself*) with their antecedents is an example of a grammatical ability that has been shown to gradually increase as children get older. Children are known to grasp the antecedent-reflexive relationship (governed by Principle A of the Binding Theory, Chomsky 1981) earlier than they do the antecedent-pronoun relationship (governed by Principle B of the Binding Theory), according to Chien & Wexler (1990) and Sekerina, Stromswold & Hestvik (2004).

Consequently, Binding Principles A & B appear to be appropriate candidate domains of grammar, as they appear in previous work to develop gradually, as do verb finiteness and inversion. Additionally, these principles were selected because their relationship with verb finiteness and subject-auxiliary inversion has yet to be studied.

Section 2.1: Experimental Overview and Assessment Creation

In order to collect this correlation data, a completely new assessment solely testing children's knowledge of the Binding Principles A and B was created. This test was named the Binding Principles Grammaticality Choice Task. The Grammaticality Choice format was chosen so that any failure to correlate between the growth of binding principles, VF and SAI could not be ascribed to differences in format. The creation of this new assessment required manipulation of pre-existing images so that images presented would be in the required format. 5 images were created as warm-up items, 18 images were created as test items and 5 images were created as filler items.

Section 2.2: Methods

Participants

All participants selected were native speakers of English enrolled in daycare centers in Columbus, Ohio. After parental and participant consent was obtained, all children were given the assessment on-site at the daycare center. Out of a sample of 53 TD children, 10 did not pass filler items. Therefore, 43 children were retained in the sample. These children ranged in age from 3;3 to 5;11, with a mean age of 4;5.

Procedures

When being introduced to the task, children were asked if they would like to play a game with puppets. They were then informed that the puppets (a pig and an elephant) were babies and did not yet know how to "talk". Each child was then asked if he or she could help teach the animals how to "talk" correctly. Then, the child and examiner looked at a picture featuring two animals unrelated to the puppets. One puppet proceeded to "say" a correct sentence about the picture, while the other puppet "said" the same sentence incorrectly. The child was then asked to determine which puppet said the sentence "better."

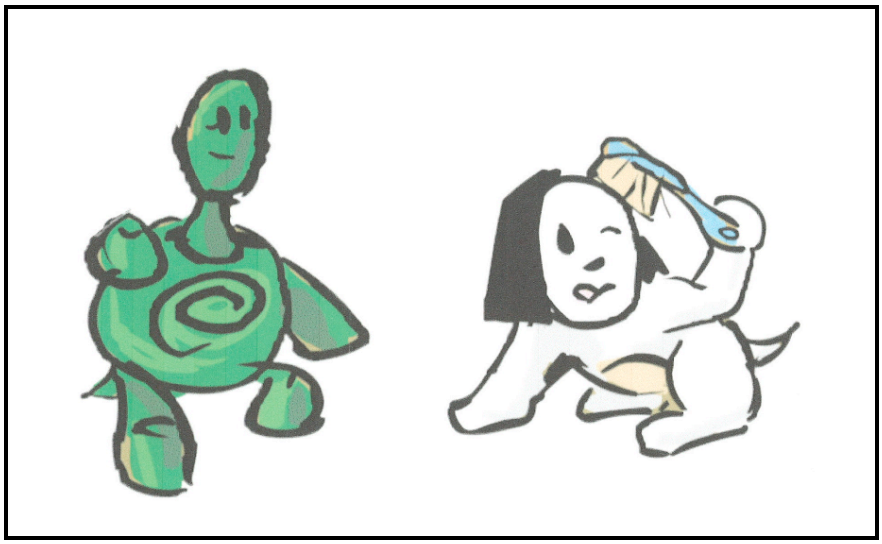


Figure 2.1: Sample picture from the Binding Principles Gram. Choice Task (Reflexive)

The above image (Figure 2.1) is taken from the Binding Principles Grammaticality Choice Task and was designed to test the reflexive (ie. *himself*) construction. See Appendix B for a complete compilation of stimuli images.

The following is a sample of the dialogue corresponding to Figure 2.1:

Elephant Puppet: *The turtle thinks that the dog is brushing him.

Pig Puppet: The turtle thinks that the dog is brushing himself.

Test Administrator: Who said it better, the Pig or the Elephant?

Figure 2.2: Sample picture from the Binding Principles Gram. Choice Task (Pronoun)

The above image (Figure 2.2) is taken from the Binding Principles Grammaticality Choice Task and was designed to test the pronoun (ie. *him*) construction. (see Appendix B for a complete compilation of stimuli images)

The following is a sample of the dialogue corresponding to Figure 2.2:

Elephant Puppet: The dog thinks the cat is brushing him.

Pig Puppet: *The dog thinks that the cat is brushing himself.

Test Administrator: Who said it better, the Pig or the Elephant?

The Binding Principles Grammaticality Choice Task consists of 28 total items. These items were divided into five warm-up/practice items, 18 items scored for accuracy, and five filler items dispersed randomly throughout the assessment. Items utilized for warm-up/practice purposes were used solely to introduce the child to the test and were never scored for accuracy. During or after the five practice items, the child was reminded, "sometimes the pig is right (correct) and sometimes the elephant is right (correct), so

paying close attention is important." This was done to encourage the child to attend to the task, as well as discourage the child from favoring one puppet over another. This also discouraged the child from thinking a pattern of correct and incorrect responses existed within the assessment.

During the warm-up/practice items, if children answered incorrectly they were corrected and then given an explanation of the correct answer. This was done to introduce the format of the assessment to the child. The filler items were intended to ensure that children understood the format of the assessment and were attending to the task. These items were dispersed randomly throughout each order of the test and consisted of spatial judgments as in example (6), Figure 2.3, below.

(6) The man is under the cloud.

*The man is over the cloud.

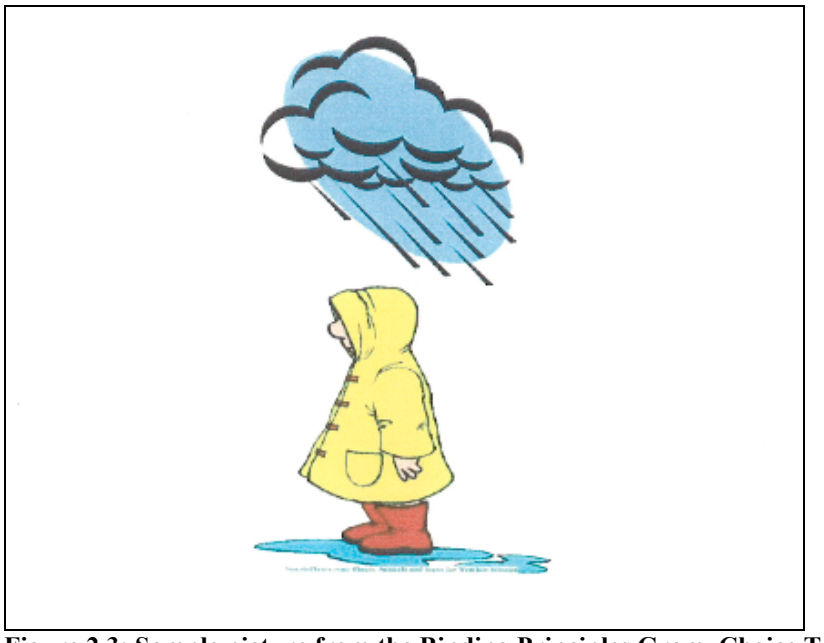


Figure 2.3: Sample picture from the Binding Principles Gram. Choice Task

It is important to note that the only corrective feedback children received pertained to the warm-up/practice items. Children received praise, such as "great job",

throughout the entire assessment and were rewarded with a sticker after the assessment was finished.

Items scored for accuracy consisted of pairs of sentences, with each pair consisting of one sentence with reflexive marking and one sentence with pronoun marking. In this manner, determination of the correct sentence marking was dependent upon the picture being viewed. Each picture viewed was a direct description of the correct sentence. Following is a breakdown of test components as they relate to reflexives and pronouns. Three different verbs (wash, brush and feed) were used for both reflexive and pronoun items. This is reflected in the table below.

	Correct Response	Incorrect Response	Wash	Brush	Feed	Total
Reflexive *-himself*	The dog thinks the cat is brushing himself.	*The dog thinks that the cat is brushing him.	3 items	3 items	3 items	9 items
Pronoun *-him*	The turtle thinks that the dog is feeding him.	*The turtle thinks that the dog is feeding himself.	3 items	3 items	3 items	9 items

Table 2.1- Example sentences from Binding Principles Grammaticality Choice Task

Section 2.3: Results and Discussion

Overall results for the Binding Principles Grammaticality Choice Task showed 66% correctness across participants. Participants achieved a higher performance for the reflexive (himself) (72.%) as compared to the pronoun (him) (62%), as demonstrated by

paired samples t-test ($t(42) = -2.099$, $p = .049$). Table 2.2 displays the results across all participants, and Table 2.3 displays the results respectively by age group.

	Average Score
Reflexive -himself	278/387= 72%
Pronoun -him	238/387= 62%

Table 2.2 Overall Results of Binding Principles Grammaticality Choice Task

Age Groups	**Reflexive**	**Pronoun**	**Overall Average Score**
3 year olds (n=8)	43/72 = 60%	38/72= 53%	81/144= 56% correct
4 year olds (n=23)	152/207= 73%	128/207= 62%	280/414= 68% correct
5 year olds (n=12)	83/108 = 77%	72/108= 67%	155/216= 72% correct
Total	278/387= 72%	238/387= 62%	516/774= 67% correct

Table 2.3 Overall Results of the Binding Principles Grammaticality Choice Task by age.

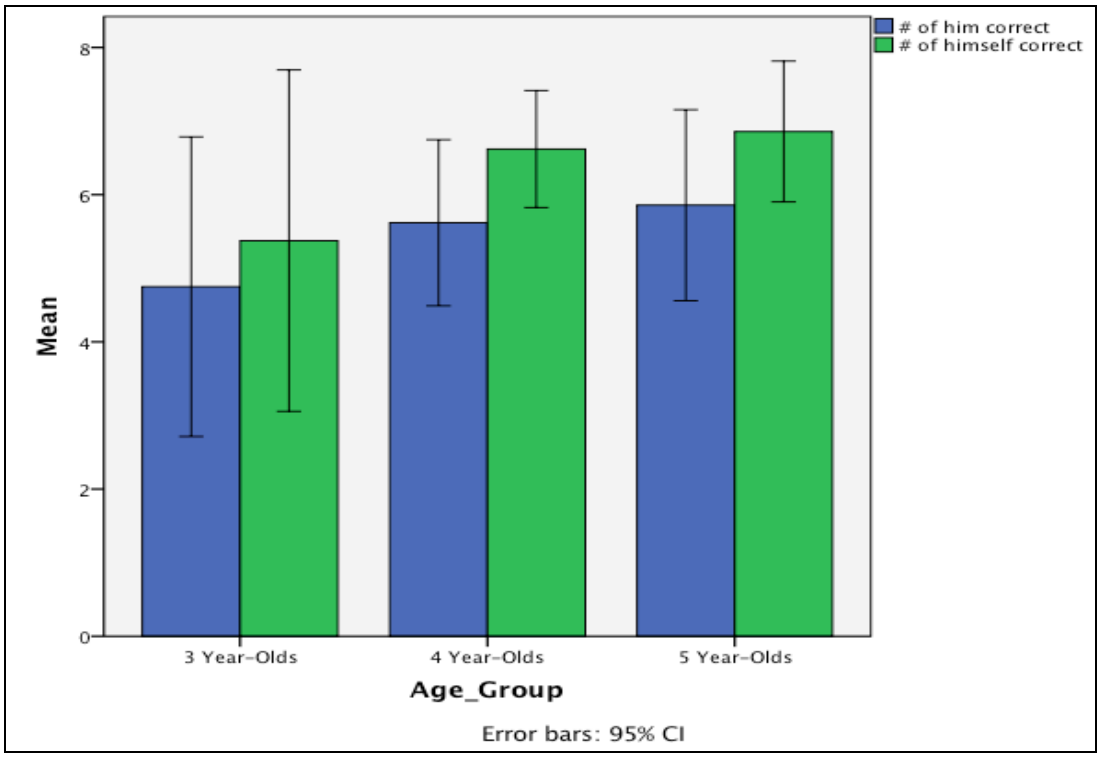


Chart 2.1 Results of the Binding Task by age group

In analysis of Binding results, it was hoped that children's judgments of these principles improve over time. These results are shown in Chart 2.1 above. In this way, our assessment of the Binding Principles using the Grammaticality Choice format is similar to the assessments measuring verb finiteness and SAI, which also improve over time. This is consistent with the findings of Chien & Wexler (1990) and Sekerina, Stromswold & Hestvik (2004).

Section 2.4: Summary and Conclusion

In conclusion, Binding knowledge, improves with age. It is known from previous work that Finiteness and Inversion improve with age as well (Ricci 2009, Donnellan 2010). If it is then found that Finiteness and Inversion correlate with one another, but not with Binding, the relationship between Finiteness and Inversion will be confirmed and

supported. (See Chapter 3 for results of this further study.) Again, age will be partialed out of all correlations.

Chapter 3: Study 2: Grammaticality Choice Study of TD Children on Verb Finiteness, SAI and Binding

Section 3.0: Experimental Overview

After finding that children's knowledge of the Binding Principles, as tested with the Grammaticality Choice format, improves with age, statistical analysis was performed on items from this task, the Verb Finiteness Grammaticality Choice Task (Donnellan 2010) (which is called Finiteness 1 in this study), the Nonfinite Verb Grammaticality Choice Task (Ricci 2009) (which is called Finiteness 2 in this study), the Subject-Auxiliary Inversion Grammaticality Choice Task (Ricci 2009), and the Pronoun Case Grammaticality Choice Task (Donnellan 2010; details and results of this portion of the study are reported in Heath 2011). The objective was to select a small number of items from each measure and combine them into a test that could be administered quickly. These items were selected based on correlation values among items used on each test. Items were then identified between tasks (e.g. the Subject-Aux Inversion task and the Verb Finiteness Task) that displayed the highest correlation values. Binding was excluded from this process, and item-total correlations from this task were used to identify the strongest items within the task. These items together formed an assessment, which was called, simply, the Combined Grammaticality Choice Task.

Section 3.1: Methods

Participants

As in the study outlined in Chapter 2, all participants selected were native speakers of English enrolled in daycare centers in Columbus, Ohio. After parental and participant consent was obtained, all children were given the assessment on-site at the daycare center. Of the 52 children tested, 44 passed filler items and were included in the sample. These children were between the ages of 3;6 and 6;2. The mean age of all participants was 4;8.

Procedures

At the introduction of the task, children were asked if they would like to play a game with puppets (a raccoon and an eagle). Realistic looking puppets were intentionally used in order to keep the child's attention and excitement during this longer assessment. The children were then told that the puppets were baby animals who were still learning how to "talk", and that "sometimes each animal said something that sounded kind of funny". Each child was then asked if he or she could help teach the animals how to "talk" correctly. Then, the child and examiner looked at a picture from one of the five following assessments: the Verb Finiteness Grammaticality Choice Task (Donnellan 2010) (Finiteness 1), the Nonfinite Verb Grammaticality Choice Task (Ricci 2009) (Finiteness 2), the Subject-Auxiliary Inversion Grammaticality Choice Task (Ricci 2009), the Pronoun Case Grammaticality Choice Task (Donnellan 2010), and the Binding Principles Grammaticality Choice Task, reflexive and pronoun respectively, detailed in Chapter 2. One puppet proceeded to "say" a correct sentence about the picture, while the other

puppet “said” the same sentence incorrectly. The child was then asked to determine which puppet said the sentence “better.”

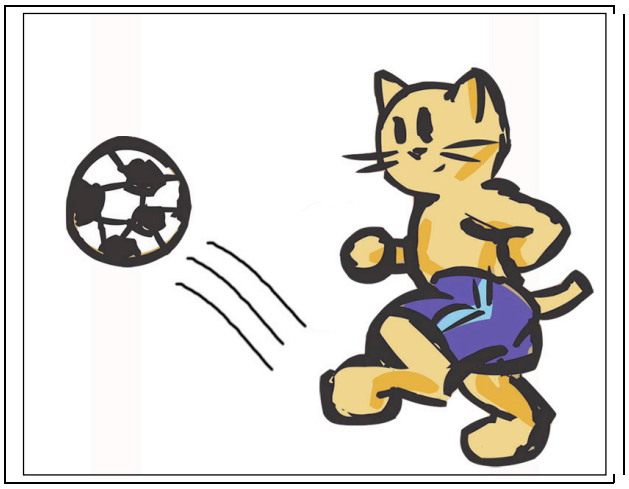


Figure 3.1: Sample picture shown to children from the Verb Finiteness Gram. Choice Task (Finiteness 1)

Figure 3.1, along with the following dialogue, compile an item taken from the Verb Finiteness Grammaticality Choice task.

Eagle: He kicked a ball.

Raccoon: *He kick a ball.

Administrator: Who said it better?

Figure 3.2: Sample picture shown to children from the Nonfinite Verb Gram. Choice Task (Finiteness 2

Figure 3.2, along with the following dialogue, compile an item taken from the Nonfinite Verb Grammaticality Choice task.

Raccoon puppet: *Donald angry.

Eagle puppet: Donald is angry.

Administrator: Who said it bette

Figure 3.3; Sample picture shown to children from the Subj.-Aux. Inversion Gram. Choice Task

Figure 3.3, along with the following dialogue, compile an item taken from the Subject-Auxiliary Inversion Grammaticality Choice task.

Eagle: *Why Pooh is looking in the pot?

Raccoon: Why is Pooh looking in the pot?

Administrator: Who said it better?

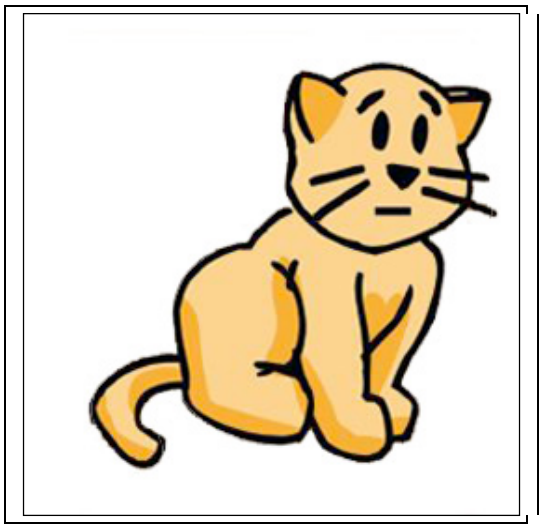


Figure 3.4: Sample picture shown to children from the Pronoun Case Gram. Choice Task

Figure 3.4, along with the following dialogue, compile an item taken from the Pronoun Case Grammaticality Choice task.

Raccoon: He is orange.

Eagle: *Him is orange.

Administrator: Who said it better?

The above example was included here to give a complete account of the Task performed. Results of the Pronoun Case portion of this study are detailed in Heath 2011.

Please see Chapter 2, pages 20 and 21 for reflexive and pronoun examples of the Binding Principles Grammaticality Choice Task.

The format of the Combined Grammaticality Choice Task was the same as the Binding Principles Grammaticality Choice Task from Study 1, with the exception of being a bit longer. It contained 6 warm-up items, 24 items scored for accuracy, and 6 filler items. Again, practice items were used to introduce the child to the test and were not scored for accuracy. After the warm-up section, it was reiterated that sometimes the Eagle was right and sometimes the Raccoon was right, so close attention was essential.

	Correct Response	Incorrect Response	Frequency in Test
Finiteness 1	He kicked a ball.	*Him kicked a ball.	4
Finiteness 2	Donald is angry.	*Donald angry.	4
Subject-Auxiliary Inversion	Why is Pooh looking in the pot?	*Why Pooh is looking in the pot?	4
Pronoun Case	He watched a ball.	*Him watched a ball.	4
Binding Reflexive	The dog thinks that the cat is brushing himself.	*The dog thinks that cat is brushing him.	4
Binding Pronoun	The turtle thinks that the dog is feeding him.	*The turtle thinks that the dog is feeding himself.	4

Table 3.1 Sample sentences from the Combined Grammaticality Choice Task

Filler questions consisted of sentences that contrasted correct and incorrect nominal plural marking *–s* and the present progressive verb ending *–ing*, both of which are typically acquired by 3 years of age and both of which have previously been used successfully as filler items (Donnellan 2010; cf. Rice, Wexler & Redmond 1999; McDaniels & Cairns 1990). Filler items consisted of 6 compared sentence pairs illustrated in (3.1):

(3.1) a. The dog had two friends.
*The dog had two friend.

b. *The turtle is play soccer.
The turtle is playing soccer.

c. The turtle wants two cookies.
*The turtle wants two cookie.

d. *The dog is run.
The dog is running.

e. The dog was dancing.
*The dog was dance.

f. The turtle is singing.
*The turtle is sing.

Filler items were used to determine the child's understanding of the task. The administrator gave close attention to the child's responses, and filler items were placed strategically throughout the test to discourage the formation of any pattern a child may develop in response to test items. For instance, if the child seemed to have a favorite puppet, the administrator ensured that the opposite puppet give the correct response during filler questions. If a child missed more than two filler questions, their data was excluded from the pool.

Section 3.2: Results and Discussion

The overall results of the Combined Grammaticality Choice Task show 75% correct judgments. For the measures that relate to the Verb Finiteness Task (Finiteness 1), the mean correct percentage was 82%. Items from the Nonfinite Verb Task (Verb Finiteness 2), had a mean percentage correct of 80%. Measures relating to Subject-Auxiliary Inversion had a mean percentage correct of 65%. Pronoun Case had a mean percentage correct of 85%. Case judgment results are studied further in Heath 2011. Binding Reflexive items had a mean percentage correct 72%, and Binding Pronoun items had a mean percentage correct of 67%. Participants achieved a higher performance for Pronoun Case (85%) as compared to Subject-Auxiliary Inversion (65%). Table 3.2 shows the breakdown of the 44 participants that passed the fillers in all three tasks.

	Average Score
Finiteness 1	3.30 (82%)
Finiteness 2	3.18 (80%)
Subject-Auxiliary Inversion Items	2.61 (65%)
Pronoun Case Items	3.41 (85%)
Binding Reflexive Items	2.91 (72%)
Binding Pronoun Items	2.68 (67%)

Table 3.2 Overall Results of the Combined Grammaticality Choice Task

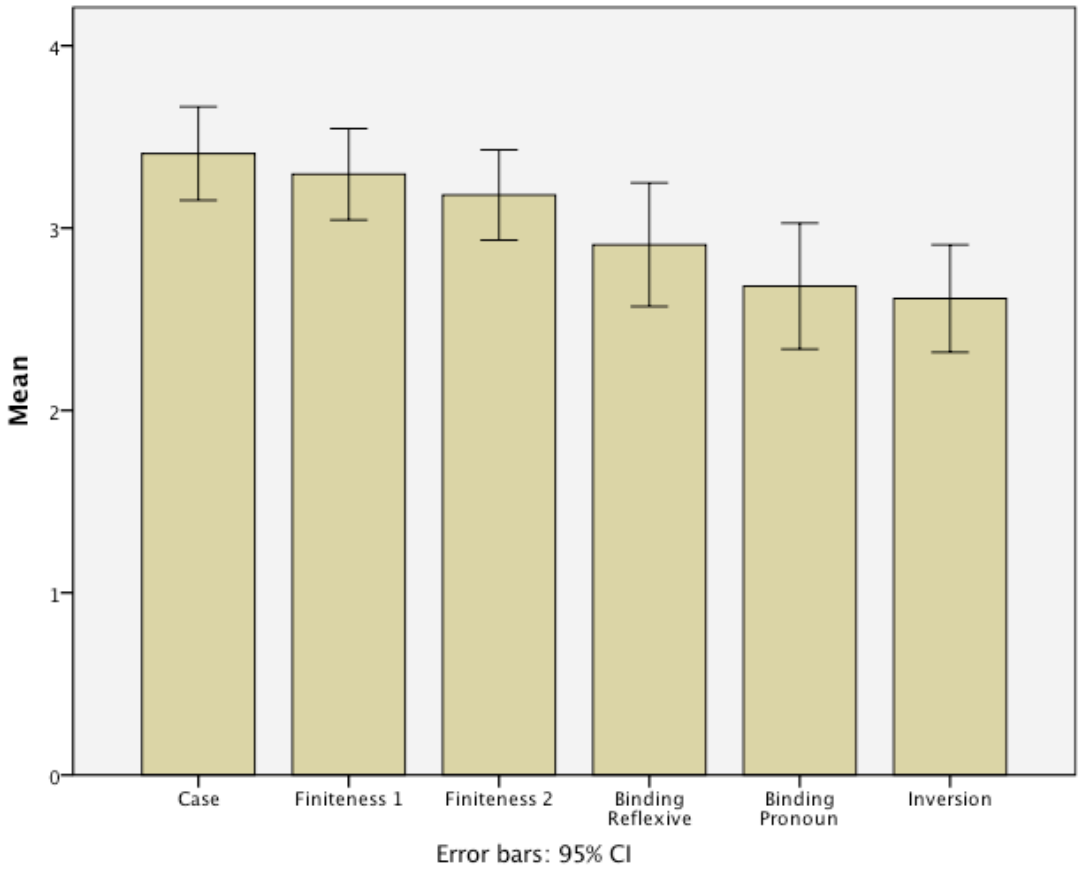


Chart 3.1 Percent Correct Judgments by Task

The following scatter plot and correlation table shows that inversion and finiteness (Finiteness 1) correlated. Finiteness 2 did not correlate. There are multiple reasons why this might be so, including the fact that in order to shorten the test, only four items were used from each subscale. This simply may have been too little data from that test to allow for a correlation of the kind shown in Ricci (2009), from whence the items came. It is also true that those four items used two different subject types (names and full DPs) and three different finiteness markers (-s, -ed, and auxiliary be), while Finiteness 1 only used pronouns and only used –ed and aux be. The original assessment of Nonfinite Verb Grammaticality Choice used by Ricci also utilized the pronoun subjects and the morpheme copula be. In either case, the items from this test have correlated with inversion in the past (cf. Ricci 2009), so we suspect that one of these variables is responsible for absence of a correlation.

The correlation measure used here is the non-parametric Spearman's Rho, because the 4 item scale utilized here cannot produce normally distributed, continuous variables of the kind needed for a parametric Pearson's correlation. The Spearman's Rho is also designed to deal with "ties" in ordinal data of the kind that are illustrated in the following scatter plot, as evidenced by the many overlapping points. The results of this Spearman's Rho were then input into a Pearson's partial correlation to remove the effects of age, which do constitute a normally distributed, continuous variable in the sample.

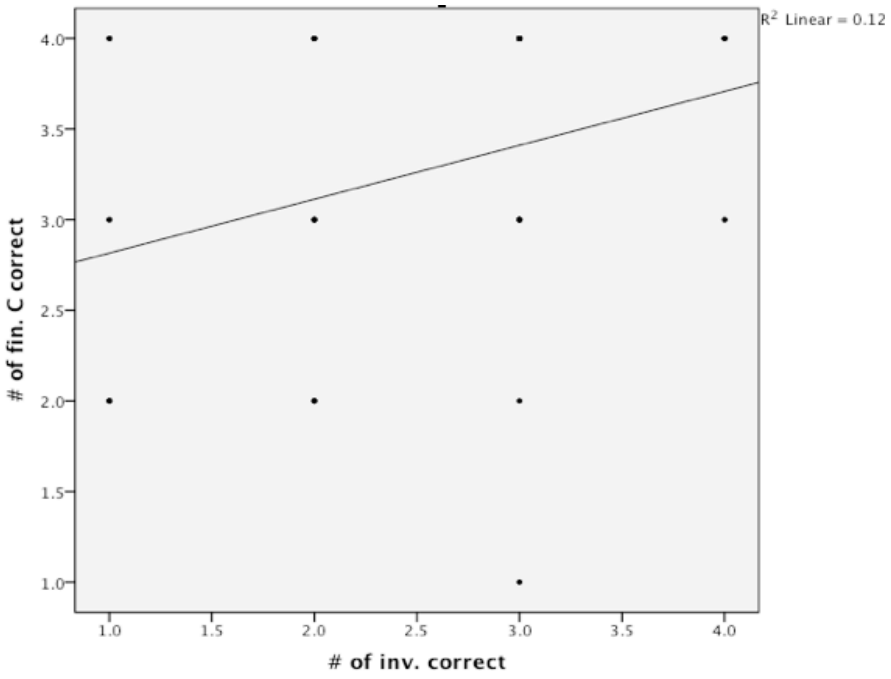


Chart 3.2 Scatter plot of Correlation between Finiteness 1 and SAI

Control Variables		Finiteness 1	Finiteness 2	Binding Pronoun	Inversion	Binding Reflexive
Finiteness 1	Correlation	1.000	.119	.004	.370	-.038
	Significance (2-tailed)	.	.448	.977	.015	.810
	df	0	41	41	41	41
Finiteness 2	Correlation		1.000	.331	.195	.047
	Significance (2-tailed)		.	.030	.210	.763
	df		0	41	41	41
Binding Pronoun	Correlation			1.000	.020	-.022
	Significance (2-tailed)			.	.897	.888
	df			0	41	41
Inversion	Correlation				1.000	.249
	Significance (2-tailed)				.	.108
	df				0	41

Table 3.3 Table showing correlation values between Finiteness, Inversion, and Binding

Section 3.3: Summary and Conclusion

Surprisingly, a correlation was found between the Binding Pronoun and Finiteness 2. It is not certain why this is the case, but it may be due to specific items from each test. Also, Finiteness 2 and Inversion show no correlation. Again, it is not certain why this is the case, but it may be due to specific items from each test. It is important to point out that, though these results cloud study findings, they do not negate findings as a whole. A main objective of the study was to find Finiteness items that correlate with Inversion, while at the same time, have no correlation with the Binding Principles. These were successfully found in Finiteness 1 items. Based then, on Finiteness 1, results show that children's judgments of the binding principles do not correlate with judgments of tense (finiteness) or subject-auxiliary inversion, while judgments of finiteness and subj.-aux inversion still correlate, with age partialed out. This suggests three things about the relationship between finiteness and subject-auxiliary inversion. First, the relationship is unique (as supported by suggestions two and three) and second, it is not influenced by the binding principles. Third, and most important, using binding as a proxy for general language development, all constructions of language are not merely developing at the same rate.

Since it has then been shown that the relationship between finiteness and subject-auxiliary inversion is unique, it is likely to be found that children with SLI will struggle with judgments of finiteness. Since it is known that an area of struggle can be used as a clinical marker, it is then likely that a struggle with subject-auxiliary inversion can be used to identify the disorder.

Chapter 4: Future Directions: Study 3: Combined Grammaticality Choice Task and other factors influencing Pre-school language in TD children and children with SLI

Section 4.0: Introduction and Experimental Overview

The possibility of using subject-auxiliary Inversion as a clinical marker for SLI has been confirmed in theory. In Study 3, the way in which this theory will play out in the diagnosis of children with SLI is investigated. This will be done by compiling a revised version of the Combined Grammaticality Choice Task from Study 2 with an ASHA protocol Hearing Screening, a non-verbal IQ test (KBIT and KABC), and a widely used receptive and expressive language measure (CELF-P2). A family questionnaire is also included in order to investigate aspects that may or may not influence child language, like mothers level of education and family socioeconomic status.

Section 4.1: Methods

Participants

A research team is currently working with a potential sample of 66 TD pre-school children from local daycares. All 66 are monolingual speakers of Mainstream American English. At this time, all children have received a hearing screening, and only four have taken the Combined Grammaticality Choice Task.

In conjunction with the Preschool Language and Literacy Research Lab at Ohio State, Study 3 is planned to commence with a sample of children who have been diagnosed with Specific Language Impairment. This piece of Study 3 is hoped to occur in the Fall of 2011.

Procedures

At the introduction of the Grammaticality Choice Task, children are asked if they would like to play a game with puppets. They are then introduced to the puppets from Study 2. The children are then told that the puppets are baby animals who are still learning how to "talk", and that "sometimes each animal says something that sounds kind of funny". Each child is then asked if he or she will help teach the animals how to "talk" correctly. Then, the child and examiner look at a picture from one of the four following assessments: the Subject-Auxiliary Inversion Grammaticality Choice Task (Ricci 2009), the Verb Finiteness Grammaticality Choice Task (Donnellan 2010) (Finiteness 1 from Study 2), the Pronoun Case Grammaticality Choice Task (Donnellan 2010), and the Binding Principles Grammaticality Choice Task: Reflexive Construction spoken of in Chapter 2. One puppet proceeds to "say" a correct sentence about the picture, while the other puppet "says" the same sentence incorrectly. The child is then asked to determine which puppet said the sentence "better."

Procedures for the Hearing Screening followed ASHA protocol. Audiologists at the Speech-Language-Hearing Clinic at The Ohio State University performed all Hearing Screenings.

Professionals from the School of Psychology at The Ohio State University are currently administering all Non-verbal IQ tests. Procedures follow what is typical for the KBIT and KABC respectively.

My research partner, Madelaine Heath, and I were trained and certified to administer the CELF-P2 by the Preschool Language and Literacy Research Lab at Ohio State. All Procedures for this test follow guidelines found in CELF-P2 literature.

Section 4.2: Summary and Conclusion

After collection of this information, relationships between many factors and constructions in child language development will be examined**.** When results have been gathered and analyzed, knowledge will be gained about these children's judgments of SAI. It is at this point that certainty can be found regarding the construction's use as a clinical marker for the disorder.

Chapter 5: Research Questions Revisited

Section 5.0: Can it be shown that TD children's judgments of verb finiteness correlate with their judgments of SAI, but not with their judgments of the binding principles - another grammatical ability that develops gradually?

With respect to Verb Finiteness one (Verb Finiteness Grammaticality Choice Task, Donnellan 2010), results show that TD English-speaking children's judgments of verb finiteness do in fact correlate with their judgments of subject-auxiliary inversion, but not with their judgments of another grammatical ability that develops gradually, namely pronoun and reflexive (Binding Principle) coreference. Based on this finding, all aspects of language are not developing at the same rate.

Section 5.1: Can SAI be used to diagnose SLI?

Given the connection between finiteness and inversion confirmed here, it is plausible that children with SLI will struggle to make subject-auxiliary inversion judgments, as they do with finiteness judgments. If this is the case, then subject-auxiliary

inversion can be used as a clinical marker of SLI. The primary focus of Study 3 is to investigate this possibility.

Chapter 6: References

Ambridge, B., & Pine, J. (2006). Testing the Agreement/Tense Omission Model using an elicited imitation paradigm. *Journal of Child Language*, 33 (4), 879-898.

Ambridge, B., Rowland, C. F., Theakston, A. L., & Tomasello, M. (2006). Comparing different accounts of inversion errors in children's non-subject wh-questions: What experimental data can tell us? *Journal of Child Language, 33*(3), 519-557.

Bellugi, U. (1965). The development of interrogative structures in children's speech. In K. F. Riegel (Ed.), *The development of language functions* (pp. 103-137.). Ann Arbor, MI: University of Michigan.

Bloom, L., Hood, L., & Lightbown, P. M. (1974). Imitation in language development: if, when and why. *Cognitive Development, 6*, 380-420.

Brown, R. W. (1968). The development of Wh questions in child speech. *Journal of Verbal Learning and Verbal Behavior, 7*, 279-290.

Brown, R. W. (1973). *A first language: The early stages*. Cambridge, Mass.: Harvard University Press.

Chien, Y.-C., & Wexler, K. (1990). Children's Knowledge of Locality Conditions in Binding as Evidence for the Modularity of Syntax and Pragmatics. *Language Acquisition, 1*(3), 225-295.

Chomsky, N. (1981). *Lectures on Government and Binding.* Dordrecht: Foris.

Deevy, P., & Leonard, L. B. (2004). The comprehension of wh-questions in children with specific language impairment. *Journal of Speech, 47*(4), 802-815.

den Besten, H., & Edmondson, J. (1983). The Verbal Complex in Continental West Germanic. In W. Abraham (Ed.), *On the Formal Syntax of the Westgermania. Papers from the '3rd Groningen Grammar Talks'* (pp. 155-216). Amsterdam/Philadelphia: John Benjamins.

Donnellan, M. (2010). *Case-Finiteness Contingencies in Child Language.* Unpublished Honors Undergraduate Thesis, The Ohio State University, Columbus, Ohio.

Emonds, J. (1976). *A transformational approach to English syntax: Root, structure-preserving, and local transformations*. New York: Academic Press.

Erreich, A. (1984). Learning how to ask: Patterns of inversion in yes/no and wh-questions. *Journal of Child Language, 11*, 579-592.

Freudenthal, D., Pine, J. M., & Gobet, F. (2009). Simulating the Referential Properties of Dutch, German, and English Root Infinitives in MOSAIC. Language Learning and Development, 5(1), 1-29

Goldberg, A. E. (1995). *Constructions: A Construction Grammar Approach To Argument Structure*. Chicago, IL: U Chicago Press.

Goldberg, A. E., & Del Giudice, A. (2005). Subject-Auxiliary Inversion: A Natural Category. *The Linguistic Review, 22*(2-4), 411-428.

Grinstead, J., Warren, V., Ricci, C., & Sanderson, S. (2009). Finiteness and Subject-Auxiliary Inversion in Child English. In J. Chandlee, M. Franchini, S. Lord & G.-M. Rheiner (Eds.), *Proceedings of the 33rd annual Boston University Conference on Language Development* (pp. 211-222). Boston University: Cascadilla Press.

Harris, Z. (1951). *Methods of Structural Linguistics*. Chicago: University of Chicago Press.

Harris, T., & Wexler, K. (1996). The Optional-Infinitive Stage in Child English: Evidence from Negation. In H. Clahsen (Ed.), *Generative perspectives on language acquisition: Empirical findings* (pp. pp 1-42). Amsterdam: Netherlands: John Benjamins Publishing Co.

Heath, M. (2011). *Pronominal Case Judgment and Verb Finiteness Marking in Children with Specific Language Impairment.* Unpublished Honors Thesis, The Ohio State University, Columbus.

Hildebrand, J. (1987). Markedness, acquisition and preposition stranding: What are children born with? Unpublished master's thesis, University of Calgary, Alberta.

Hyams, N. (1986). *Language Acquisition And The Theory Of Parameters*. Dordrecht, Holland: D. Reidel Publishing Company.

Ingram, D., & Tyack, D. L. (1979). Inversion of subject NP and Aux in children's questions. *Journal of Psycholinguistic Research, 8(4)*, 333-341.

Klima, Edward S., & Bellugi, Ursula. (1966). Syntactic regularities in the speech of children. In J. Lyons & R. J. Wales (Eds.), Psycholinguistics papers: The proceedings of the 1966 Edinburgh conference (pp. 183-208). Edinburgh: Edinburgh University Press.

Kuczaj, S.A. & Brannick,N. (1979). Children's use of the *wh* question modal auxiliary placement rule. *Journal of Experimental Child Psychology*, 28 (1), 43-67.

Pine, J. M., Rowland, C. F., Lieven, E. V. M., & Theakston, A. L. (2005). Testing the Agreement/Tense Omission Model: Why the Data on Children's Use of Non-Nominative

3psg Subjects Count against the ATOM. *Journal of Child Language, 32*(2), 269-289.

Pollock, J.-Y. (1989). Verb Movement, Universal Grammar, and the Structure of IP. *Linguistic Inquiry, 20*(3), 365-424.

Pratt, A., and Grinstead, J. (2007). "The optional infinitive stage in child Spanish" In A Belikova, L. Meroni, & M. Umeda (Eds.), Proceedings of Generative Approaches to Language Acquisition - North America (351-362). McGill University, Montreal: Cascadilla Press.

Ricci, C. (2009). *Developmental Connections between Verb Inflection and Subject-Verb Inversion in Pre-school Children with Specific Language Impairment.* Unpublished Honors Undergraduate Thesis, The Ohio State University, Columbus.

Rice, M. L., & Wexler, K. (1996). Toward Tense as a Clinical Marker of Specific Language Impairment in English-Speaking Children. *Journal of Speech and Hearing Research, 39*(6), 1239-1257.

Rice, M. L., Wexler, K., & Hershberger, S. (1998). Tense over Time: The Longitudinal Course of Tense Acquisition in Children with Specific Language Impairment. *Journal of Speech, Language, and Hearing Research, 41*(6), 1412-1431.

Rice, M. L., Wexler, K., & Redmond, S. M. (1999). Grammaticality Judgments of an Extended Optional Infinitive Grammar: Evidence from English-Speaking Children with Specific Language Impairment. *Journal of Speech, Language, and Hearing Research, 42*(4), 943-961.

Rizzi, L. (1996). Residual Verb Second and the Wh-Criterion. In A. Belletti & L. Rizzi (Eds.), *parameters and functional heads: essays in comparative syntax* (pp. pp 63-90). New York: NY: Oxford U Press.

Rowland, C. F., & Pine, J. M. (2000). Subject-auxiliary inversion errors and wh-question acquisition: 'what children do know?'. *Journal of Child Language, 2000, 27, 1, Feb, 27*(1), 157-181.

Rowland, C. F., Pine, J. M., Lieven, E. V. M., & Theakston, A. L. (2005). The Incidence of Error in Young Children's Wh-Questions. *Journal of Speech, Language, and Hearing Research, 48*(2), 384-404.

Santelmann, L., Berk, S., Austin, J., Someshankar, S., Lambert, K., & Lust, B. (2002). Continuity and development in the acquisition of inversion in yes/no questions. *Journal of Child Language, 29*(4), 813-840.

Sekerina, I. A., Stromswold, K., & Hestvik, A. (2004). How Do Adults and Children Process Referentially Ambiguous Pronouns? *Journal of Child Language, 31*(1), 123-152.

Stromswold, K. (1992). *Learnability and the Acquisition of Auxiliaries.* Unpublished Doctoral Dissertation, MIT.

Travis, L. (1984). Parameters and effects of word order variation. Unpublished Doctoral Dissertation, MIT, Cambridge.

Vega Mendoza, M. Subject-Verb Inversion in wh- questions in Spanish. Unpublished MA Paper. The Ohio State University, Columbus, Ohio.

Warren, V. (2007). *Children's Grammaticality Judgments of Nonfinite Verbs & Uninverted Wh-Questions.* Unpublished Undergraduate Thesis, The Ohio State University, Columbus.

Wexler, K. (1994). Optional infinitives, head movement and the economy of derivations. In N. Hornstein & D. Lightfoot (Eds.), *Verb Movement*. Cambridge, UK: Cambridge University Press.

Wexler, K. (1998). Very early parameter setting and the unique checking constraint: A new explanation of the optional infinitive stage. *Lingua, 106*(1-4), 23-79.

Van der Lely, H. K. J., & Battell, J. (2003). WH-Movement in Children with Grammatical SLI: A Test of the RDDR Hypothesis. *Language, 79*(1), 153-181.

Chapter 7: List of Charts, Figures and Tables

Chapter 1: Introduction and Literature Review

Chapter 2: Grammaticality Choice Study of Binding Principles

Chapter 3: Study 2: Grammaticality Choice Study of TD Children on Verb Finiteness, SAI and Binding

Chapter 8: Appendices

Appendix A: Stimuli Sentences

A.1 Binding Principles Grammaticality Choice

Warm Up
1a. The dog thinks that the apples are in the tree.
1b. The dog thinks that the apples are on the ground.
2a. The bees are out of the hive.
2b. The bees are on the hive.
3a. The grandparents are sitting on the couch.
3b. The grandparents are sitting on the floor.
Task: Pronoun Items
1a. The dog thinks that the turtle is washing him.
1b. The dog thinks that the turtle is washing himself.
2a. The turtle thinks that the dog is washing himself.
2b. The turtle thinks that the dog washing him.
3a. The turtle thinks that the cat is washing him.
3b. The turtle thinks that the cat is washing himself.
4a. The dog thinks that the turtle is feeding himself.
4b. The dog thinks that turtle is feeding him.
5a. The turtle thinks that the dog is feeding him.
5b. The turtle thinks that the dog is feeding himself.
6a. The turtle thinks that the cat is feeding himself.
6b. The turtle thinks that the cat is feeding him.
7a. The dog thinks that the cat is brushing himself.
7b.. The dog thinks that the cat is brushing him.
8a. The cat thinks that the dog is brushing him.
8b. The cat thinks that dog is brushing himself.
9a. The cat thinks that the turtle is brushing himself.
9b. The cat thinks that turtle is brushing him.
Task: Reflexive Items
10a. The cat thinks that the turtle is washing him.
10b. The cat thinks that turtle is washing himself.
11a. The cat thinks that the dog is washing himself.
11.b The cat think that the dog is washing him.
12a. The dog thinks that the cat is washing himself.
12b. The dog thinks that the cat is washing him.
13a. The cat thinks that the turtle is feeding him.
13b. The cat thinks that turtle is feeding himself.
14a. The cat thinks that the dog is feeding himself.
14b. The cat thinks that the dog is feeding him.
15a. The turtle thinks that the cat is brushing him.
15b. The turtle thinks that cat is brushing himself.
16a. The dog thinks that the cat is feeding him.
16b. The dog thinks that the cat is feeding himself.
17a. The dog thinks that the turtle is brushing himself.
17b. The dog thinks that the turtle is brushing him.
18a. The turtle thinks that the dog is brushing him.
18b. The turtle thinks that the dog is brushing himself.
Filler Items
1a. The books are on the shelf.
1b. The books are outside of the shelf.
2a. The bananas are in the bowl.
2b. The bananas are beside the bowl.
3a. The man is above the cloud.
3b. The man is under the cloud.
4a. The bird is flying over the fence.
4b. The bird is flying under the fence.
5a. The ball is in the sandbox.
5b. The ball is outside the sandbox.

A.2 Combined Grammaticality Choice Task

Warm Up Items
1a. The cat is smiling.
1b. The cat is smile.
2a. The dog sees two elephants.
2b. The dog sees two elephant.
3a. The cat is wear shorts.
3b. The cat is wearing shorts.
4a. The cat wants two apples.
4b.The cat wants two apple.
5a. The girl is feeding the dog.
5b. The girl is feed the dog.
6a. The cat sees two birds.
6b. The cat sees two bird.
Task: Finiteness 1 Items
1a. He laughing.
1b. He is laughing.
2a. She is dreaming.
2b. She dreaming.
3a. He kicked a ball.
3b. He kick a ball.
4a. She watched a cat.
4b. She watch a cat.
Task: Finiteness 2 Items
1a. Mr. Cowboy is riding a horse.
1b. Mr. Cowboy riding a horse.
2a. Donald angry.
2b. Donald is angry.
3a. The boy rides the bike
3b. The boy ride the bike.
4a. The boy row the boat.
4b. The boy rowed the boat.
Task: SAI Items
1a. Why is Pooh looking in the pot?
1b. Why Pooh is looking in the pot?
2a.Where can the baby turtle swim?
2b. Where the baby turtle can swim?
3a. Why is the puppy scared?
3b. Why the puppy is scared?

Task: Pronoun Case Items
1a. Her is a turtle.
1b. She is a turtle.
2a. Him is orange.
2b. He is orange.
3a. He watches the ball.
3b. Him watches the ball.
4a. She cleans the car.
4b.Her cleans the car.
Task: Binding Pronoun Items
1a. The turtle thinks that the dog is washing him.
1b. The turtle thinks that the dog is washing himself.
2a. The turtle thinks that the cat is feeding him.
2b. The turtle thinks that the cat is feeding himself.
3a. The turtle thinks that the dog is feeding himself.
3b. The turtle thinks that the dog is feeding him.
4a. The cat thinks that the dog is brushing himself.
4b. The cat thinks that the dog is brushing himself.
Task: Binding Reflexive Items
1a. The cat thinks that the dog is washing himself.
1b. The cat thinks that dog is washing him.
2a. The cat thinks that the turtle is feeding him.
2b. The cat thinks that the turtle is feeding himself.
3a. The dog thinks that the cat is feeding him.
3b. The dog thinks that the cat is feeding himself.
4a. The dog thinks that the turtle is brushing him.
4b. The dog thinks that the turtle is brushing himself.
Filler Items
1a. The turtle is playing soccer.
1b. The turtle is play soccer.
2a. The turtle wants two cookies.
2b. The turtle wants two cookie.
3a. The dog is run.
3b. The dog is running.
4a. The turtle is sing.
4b.The turtle is singing.
5a.The dog was dance.
5b. The dog was dancing.
6a. The dog had two friend.
6b. The dog had two friends.

A.3 Combined Grammaticality Choice Revised

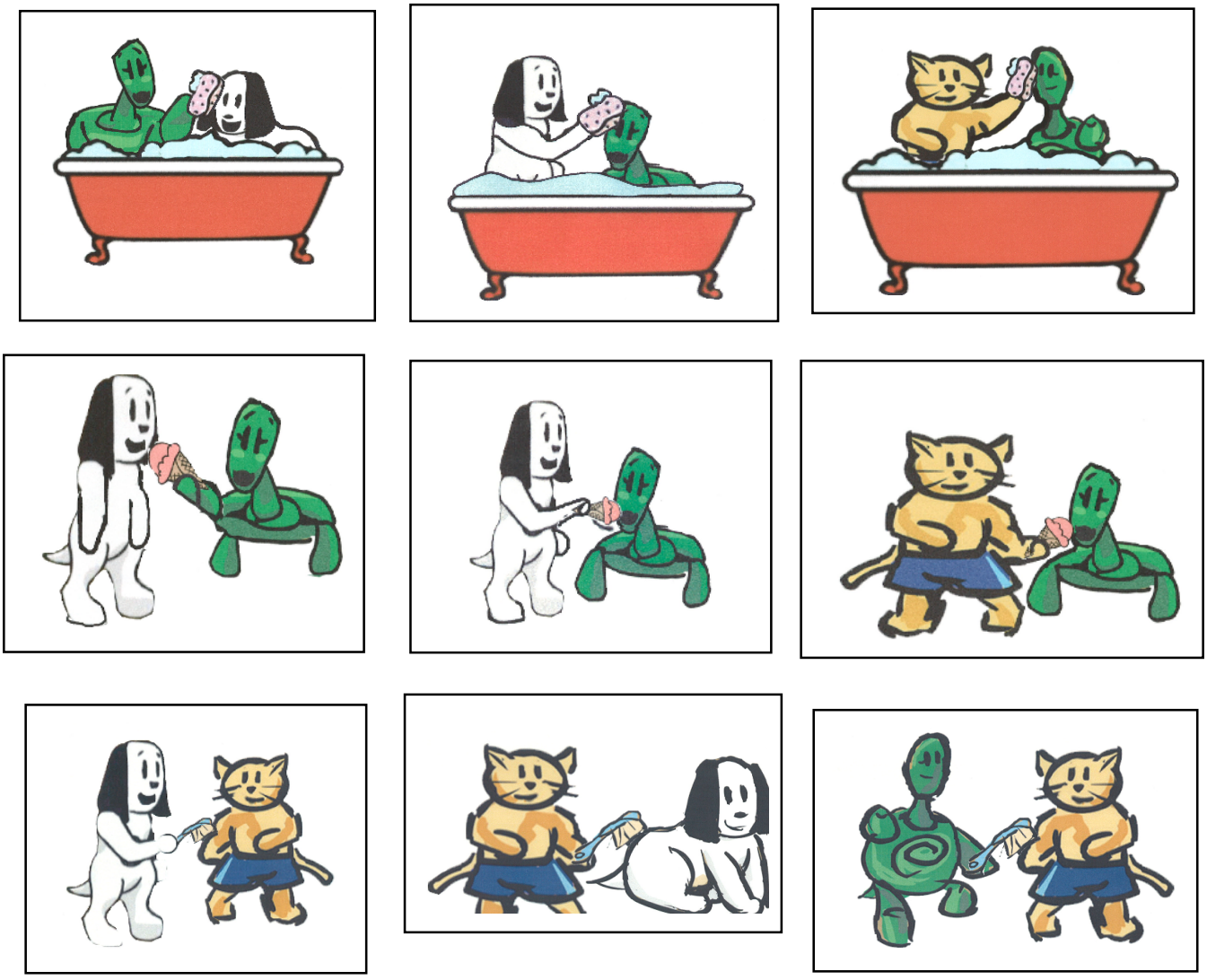
Warm Up Items
1a. The cat is smiling.
1b. The cat is smile.
2a. The dog sees two elephants.
2b. The dog sees two elephant.
3a. The cat is wear shorts.
3b. The cat is wearing shorts.
4a. The cat wants two apples.
4b.The cat wants two apple.
5a. The girl is feeding the dog.
5b. The girl is feed the dog.
6a. The cat sees two birds.
6b. The cat sees two bird.
Task: Finiteness 1 Items
1a. He laughing.
1b. He is laughing.
2a. She is dreaming.
2b. She dreaming.
3a. He kicked a ball.
3b. He kick a ball.
4a. She watched a cat.
4b. She watch a cat.
Task: SAI Items
1a. Why is Pooh looking in the pot?
1b. Why Pooh is looking in the pot?
2a.Where can the baby turtle swim?
2b. Where the baby turtle can swim?
3a. Why is the puppy scared?
3b. Why the puppy is scared?
4a. Where is the turtle sledding?
4b.Where the turtle is sledding?

Task: Pronoun Case Items
1a. Her is a turtle.
1b. She is a turtle.
2a. Him is orange.
2b. He is orange.
3a. He watches the ball.
3b. Him watches the ball.
4a. She cleans the car.
4b.Her cleans the car.
Task: Binding Reflexive Items
1a. The cat thinks that the dog is washing himself.
1b. The cat thinks that the dog is washing himself.
2a. The cat thinks that the turtle is feeding him.
2b. The cat thinks that the turtle is feeding himself.
3a. The dog thinks that the cat is feeding him.
3b. The dog thinks that the cat is feeding himself.
4a. The dog thinks that the turtle is brushing him.
4b. The dog thinks that the turtle is brushing himself.
Filler Items
1a. The turtle is playing soccer.
1b. The turtle is play soccer.
2a. The turtle wants two cookies.
2b. The turtle wants two cookie.
3a. The dog is run.
3b. The dog is running.
4a. The turtle is sing.
4b.The turtle is singing.
5a.The dog was dance.
5b. The dog was dancing.
6a. The dog had two friend.
6b. The dog had two friends.

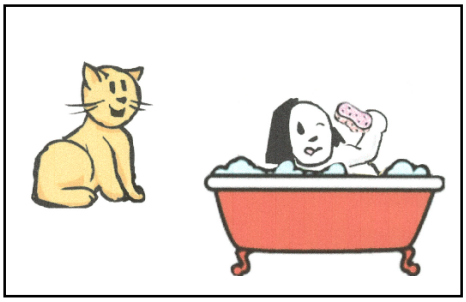
Appendix B: Stimuli Pictures

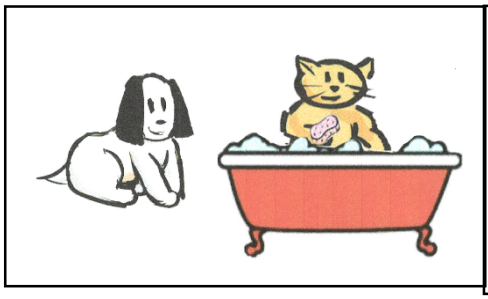
B.1 Binding Principles Grammaticality Choice Task

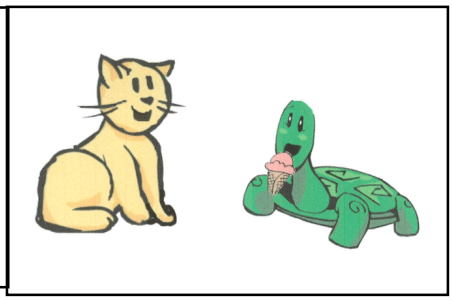
Pronoun

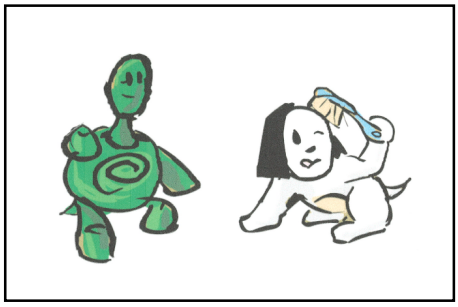


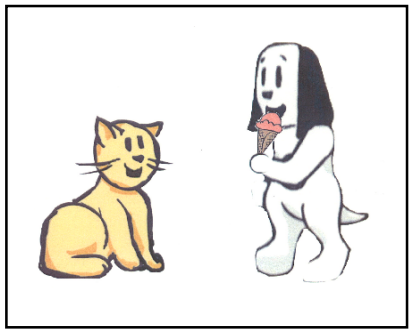
Reflexive

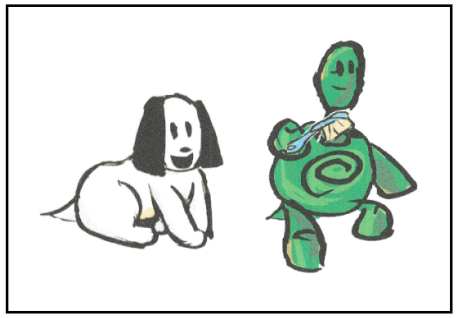


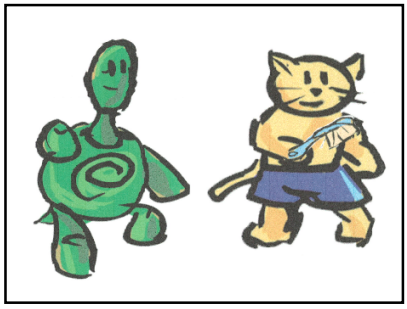


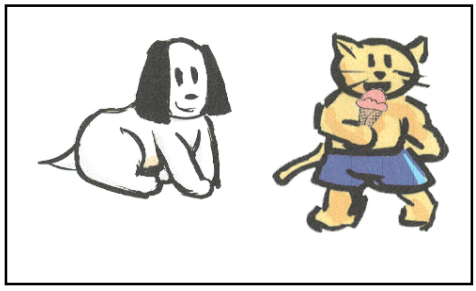


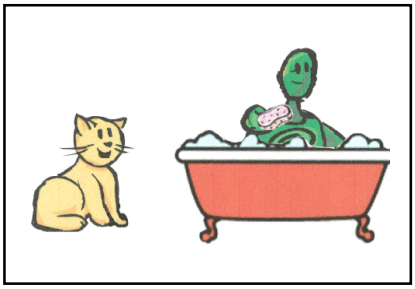




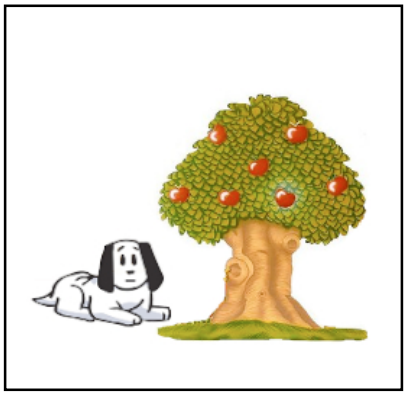


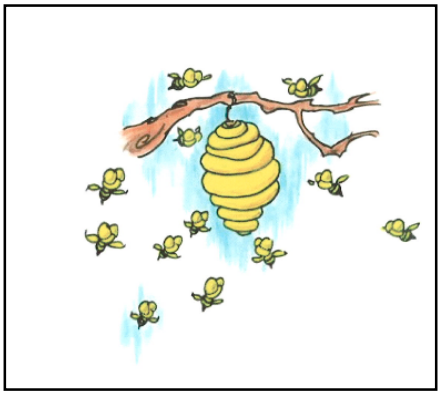


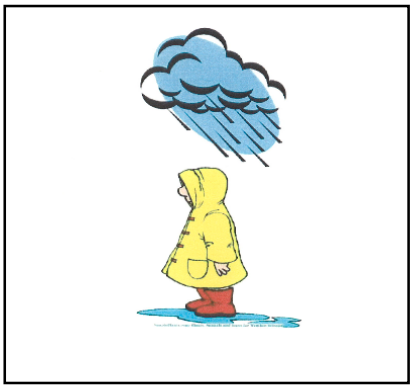


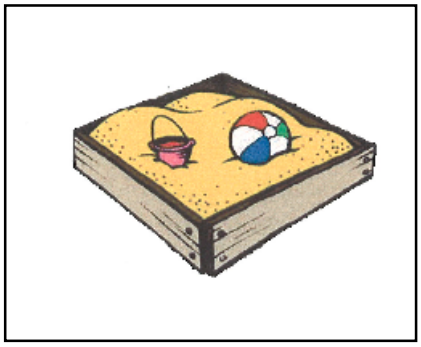


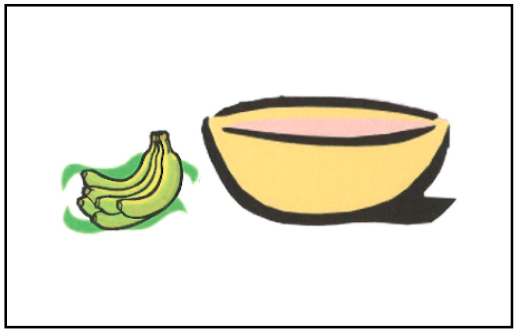
Warm-Up/Filler Items

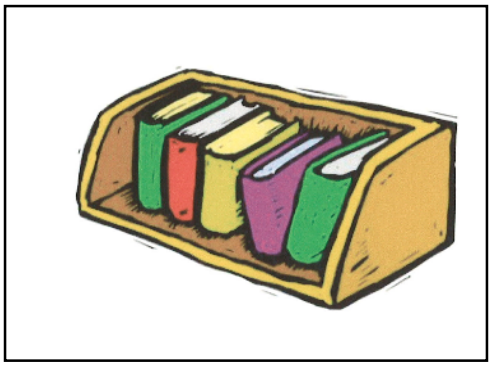


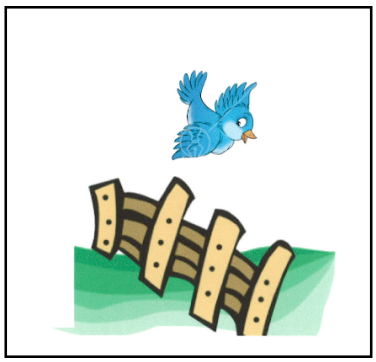






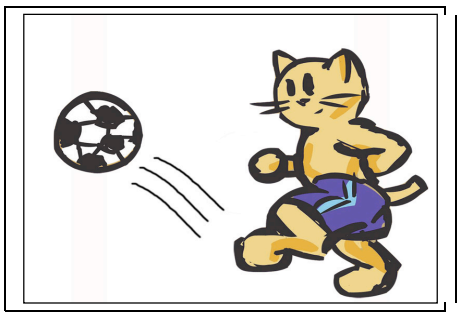


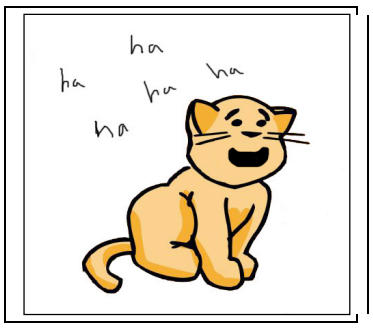


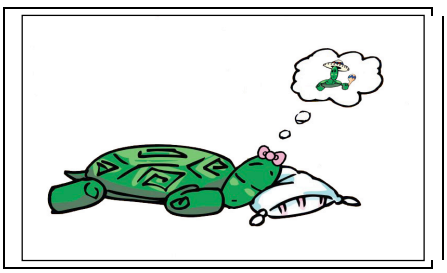


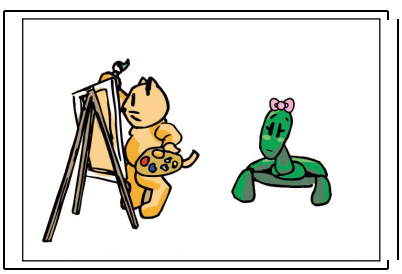
B.2 Combined Grammaticality Choice Task

Finiteness 1



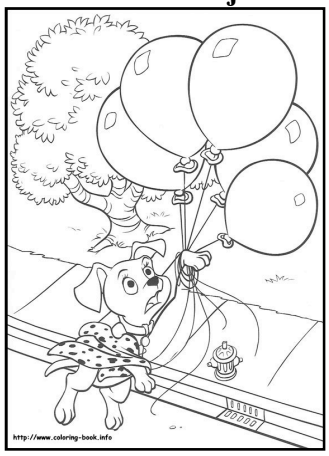


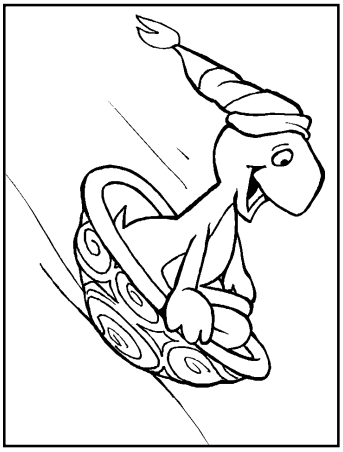


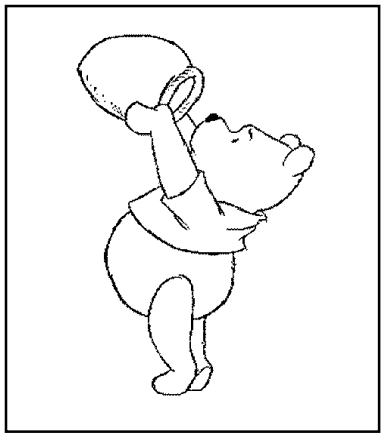


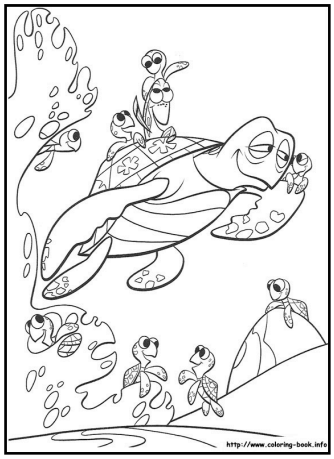
Finiteness 2

Subject-Auxiliary Inversion

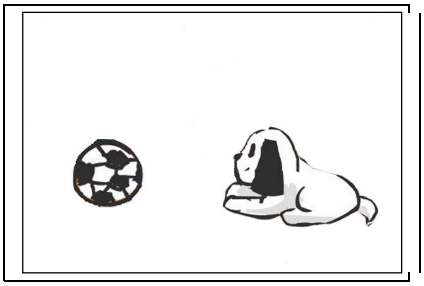


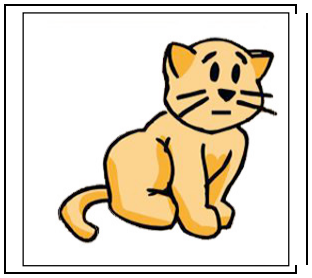


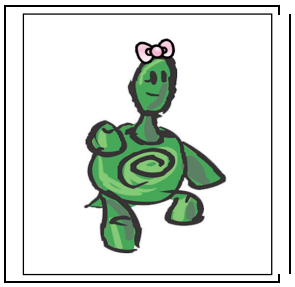


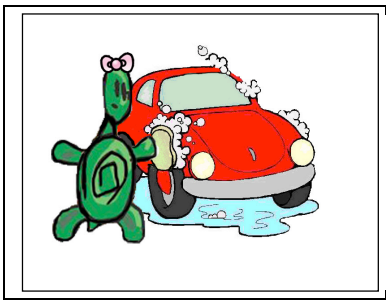


Pronoun Case

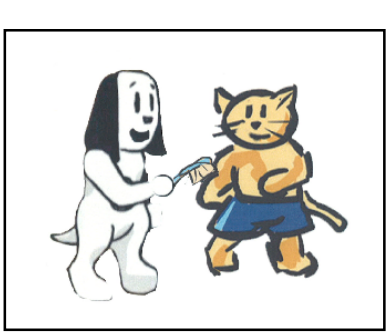
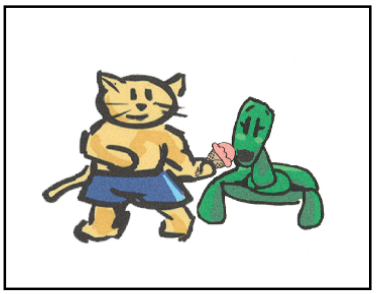
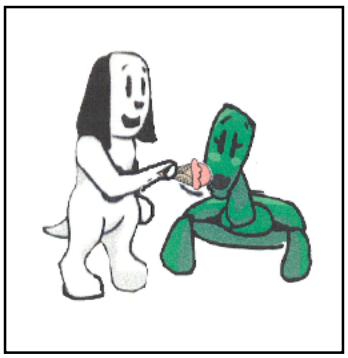
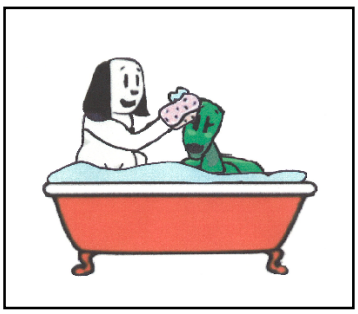




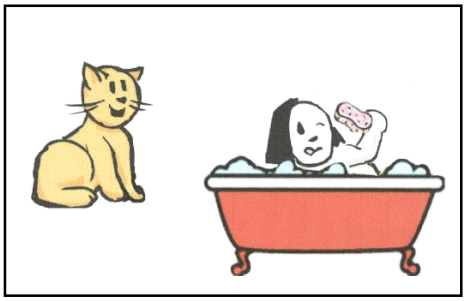
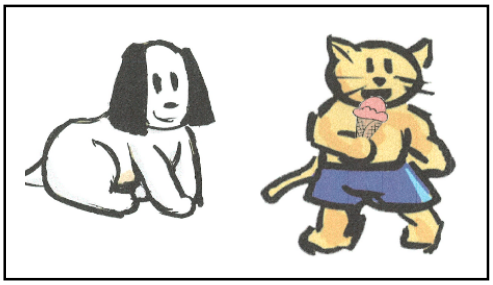
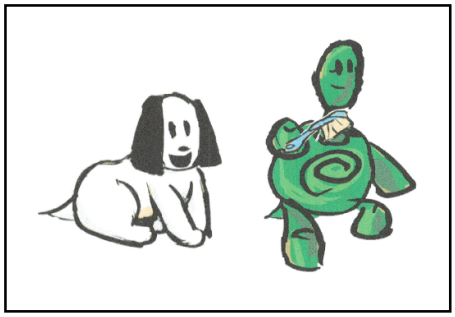
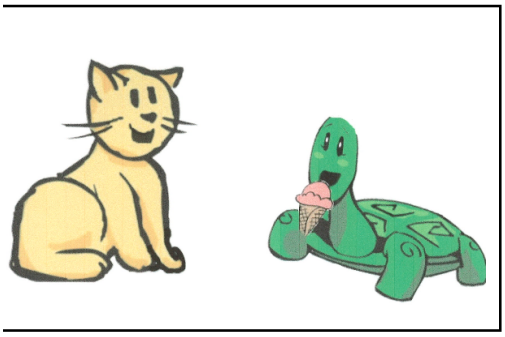




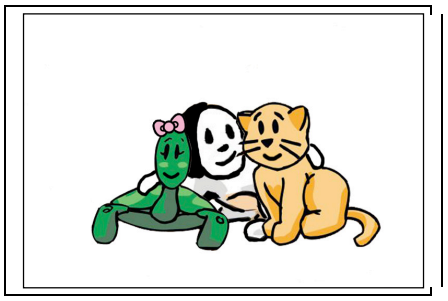
Binding Pronoun

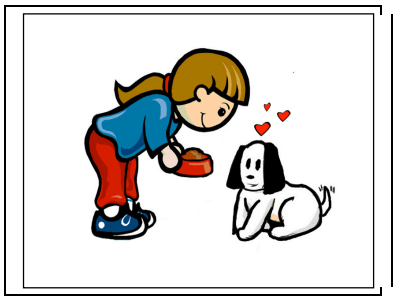





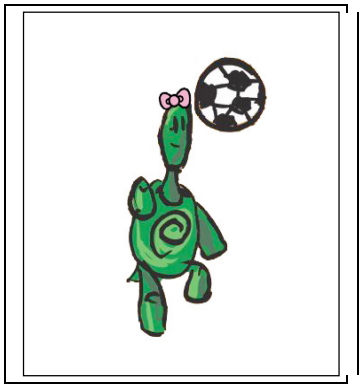
Binding Reflexive

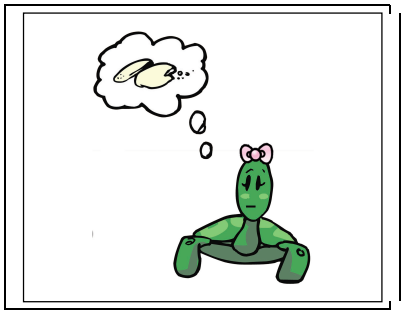





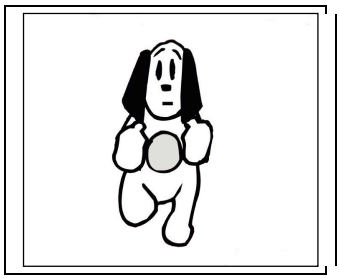
Warm-Up/Filler Items

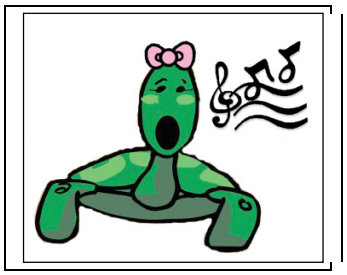


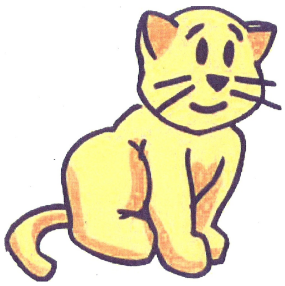


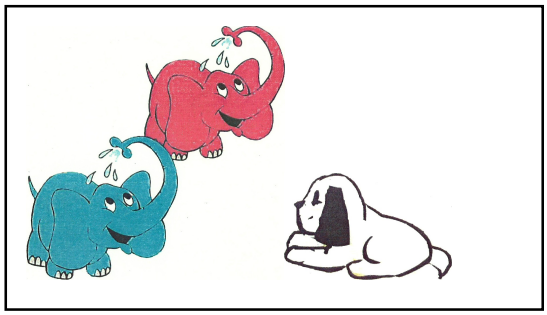


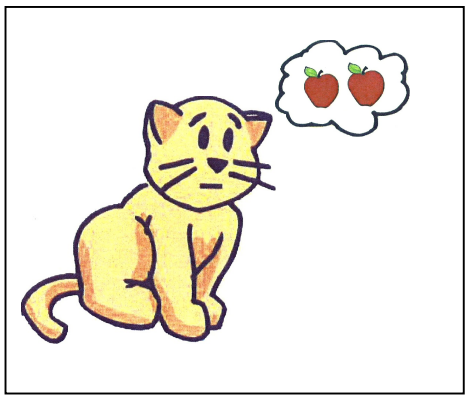


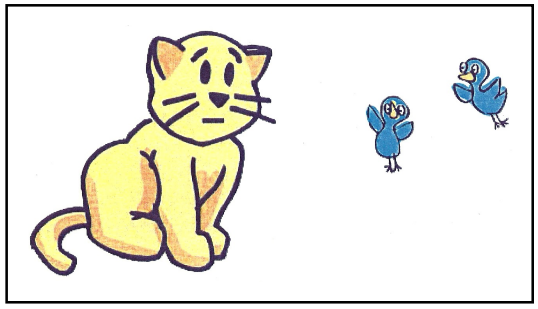


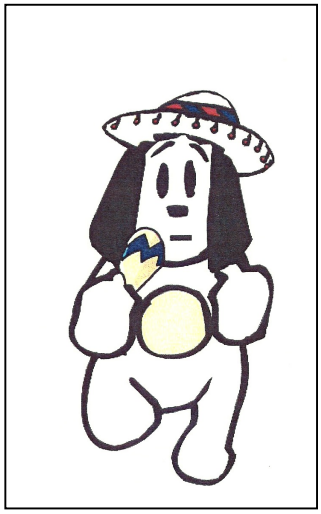












B.3 Combined Grammaticality Choice Task Revised

All stimuli are an exact replica of stimuli from B.2. In the Combined Grammaticality Choice Task Revised, all items from Finiteness 2 and Binding Pronoun have been removed.